

HARRIS
SEMICONDUCTOR
PRODUCTS DIVISION
A DIVISION OF HARRIS CORPORATION

HA-2700/2704/2705^{CHIP}

Low Power, High Performance Operational Amplifiers

2

FEATURES

- LOW POWER DISSIPATION 2.24mW AT $\pm 15.0V$
- HIGH SLEW RATE 20V/ μs
- HIGH OPEN LOOP GAIN 300k($R_L = 2k\Omega$)
- LOW INPUT BIAS CURRENT 5nA
- LOW OFFSET VOLTAGE 0.5mV
- HIGH CM_{rr} 106dB
- WIDE POWER SUPPLY RANGE $\pm 5.5V$ TO $\pm 20.0V$

APPLICATIONS

- HIGH GAIN AMPLIFIER
- INSTRUMENTATION AMPLIFIERS
- ACTIVE FILTERS
- TELEMETRY SYSTEMS
- BATTERY-POWERED EQUIPMENT

DESCRIPTION

HA-2700/2704/2705 are internally compensated operational amplifiers which employ dielectric isolation to achieve excellent DC and dynamic performance with very low quiescent power consumption.

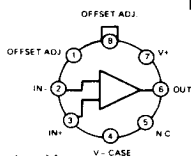
DC performance of the amplifier input is characterized by high CMRR (106dB), low offset voltage (0.5mV, HA-2700 and HA-2704; 1mV, HA-2705) along with low bias and offset current (5.0nA and 2.5nA respectively). These input specifications, in conjunction with offset null capability and open-loop gain of 300,000V/V, enable HA-2700/2704/2705 to provide accurate, high-gain signal amplification. Gain bandwidth 1MHz and slew rate of 20V/ μs allow for processing of fast, wideband signals. Input and output signal amplitudes of at least ± 11 volts can be accommodated while providing output drive capability of 10mA. For maximum reliability, the output is protected in the event of short circuits to ground.

These amplifiers operate from a wide range of supplies ($\pm 5.5V$ to $\pm 20V$) with a maximum quiescent supply drain of only 150 μA . HA-2700/2704/2705 are, therefore, ideally suited to low-power instrumentation and filtering applications that require fast, accurate response over a wide range of signal frequency.

These amplifiers are available in three performance grades: HA-2700 is rated for operation from $-55^\circ C$ to $+125^\circ C$; HA-2704 is specified over $-25^\circ C$ to $+85^\circ C$; HA-2705 is specified from $0^\circ C$ to $+75^\circ C$. All three devices are available in TO-99 cans or 14 lead D.I.P. packages.

PINOUT

TO-99

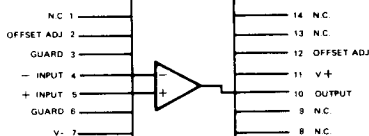


Package Code 2A, 4U

Case Connected to V-

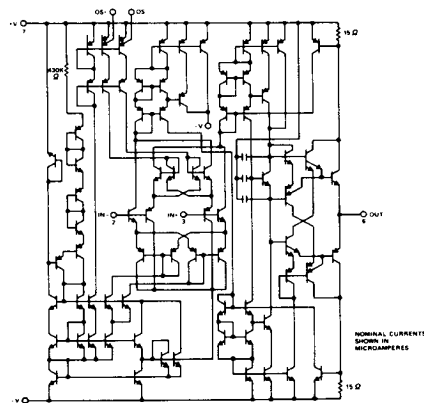
TOP VIEW

TO-116



Case Connected to V-

SCHEMATIC



2-54 CAUTION: These devices are sensitive to electrostatic discharge. Users should follow IC Handling Procedures specified on pg. 1-4.

SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS

Voltage Between V ⁺ and V ⁻ Terminals	44.0V
Differential Input Voltage	±18.0V
Internal Power Dissipation (Note 7)	300mW
Storage Temperature	-65°C ≤ T _A ≤ +150°C

ELECTRICAL CHARACTERISTICS

V⁺ = +15.0 V.D.C.

V⁻ = -15.0 V.D.C.

PARAMETER	TEMP.	HA-2700 -55°C to +125°C			HA-2704 -25°C to +85°C			HA-2705 0°C to +75°C			UNITS
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
INPUT CHARACTERISTICS											
* Offset Voltage (Note 1)	+25°C Full		0.5	3.0 5.0		0.5	3.0 6.0		1.0	5.0 7.0	mV mV
* Bias Current	+25°C Full		5.0	20.0 50.0		5.0	20.0 50.0		5.0	40.0 70.0	nA nA
* Offset Current	+25°C Full		2.5	10.0 30.0		2.5	10.0 30.0		2.5	15.0 40.0	nA nA
Common Mode Range	Full	±11.0			±11.0			±11.0			V
TRANSFER CHARACTERISTICS											
* Large Signal Voltage Gain (Notes 2 & 3)	+25°C Full	200K 100K	300K		200K 100K	300K		200K 100K	300K		V/V V/V
* Common Mode Rejection Ratio (Note 4)	Full	86	106		86	106		80	106		dB
Gain Bandwidth Product (Note 2)	+25°C		1.0			1.0			1.0		MHz
OUTPUT CHARACTERISTICS											
Output Voltage Swing (Note 2)	+25°C Full	±12.0 ±11.0	±13.0		±12.0 ±11.0	±13.0		±12.0 ±11.0	±13.0		V V
Output Current (Note 3)	+25°C		10			10			10		mA
TRANSIENT RESPONSE CHARACTERISTICS											
* Slew Rate (Notes 2 & 6)	+25°C	10	20		10	20		10	20		V/μs
POWER SUPPLY CHARACTERISTICS											
* Supply Current	+25°C		75	150		75	150		75	150	μA
* Power Supply Rejection Ratio (Note 5)	Full	86	100		86	100		80	100		dB

NOTES: 1. Can be adjusted to zero with 1 megohm pot between Pins 1 and 8 with the tap to Pin 7.

2. R_L = 2K, C_L = 100pF

3. V_O = ±10.0V

4. V_{CM} = ±10V

5. V_S = ±10.0V to ±20.0V

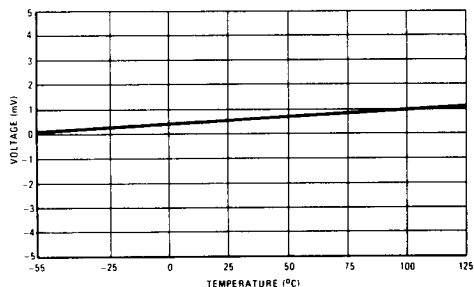
6. A_V = 5

7. Derate by 6.6 mW/°C above 105°C.

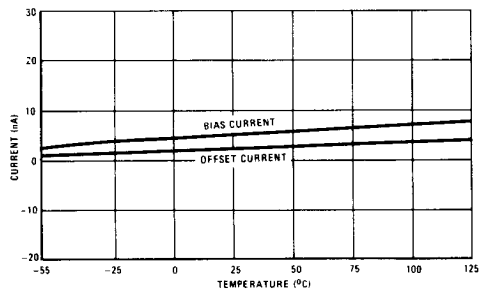
* 100% Tested For DASH 8

TYPICAL PERFORMANCE CURVES

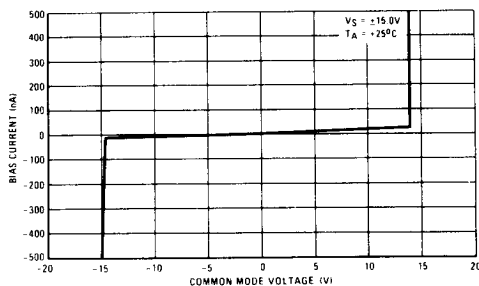
OFFSET VOLTAGE AS A FUNCTION OF TEMPERATURE



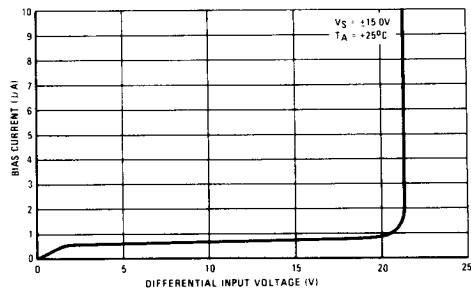
INPUT BIAS CURRENT AND OFFSET CURRENT AS A FUNCTION OF TEMPERATURE



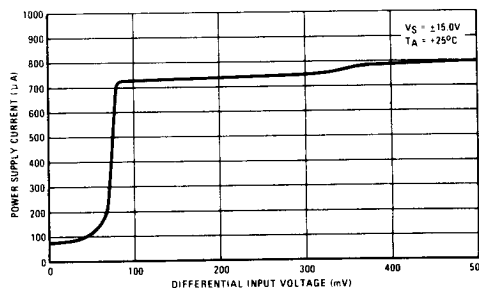
BIAS CURRENT AS A FUNCTION OF COMMON MODE VOLTAGE



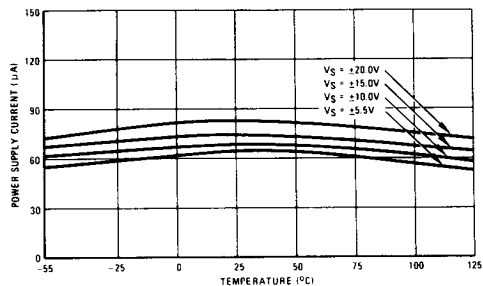
BIAS CURRENT AS A FUNCTION OF DIFFERENTIAL INPUT VOLTAGE



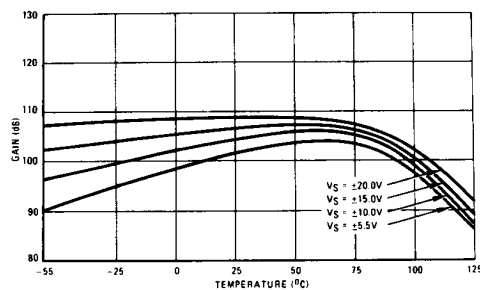
POWER SUPPLY CURRENT AS A FUNCTION OF DIFFERENTIAL INPUT VOLTAGE



POWER SUPPLY CURRENT AS A FUNCTION OF TEMPERATURE



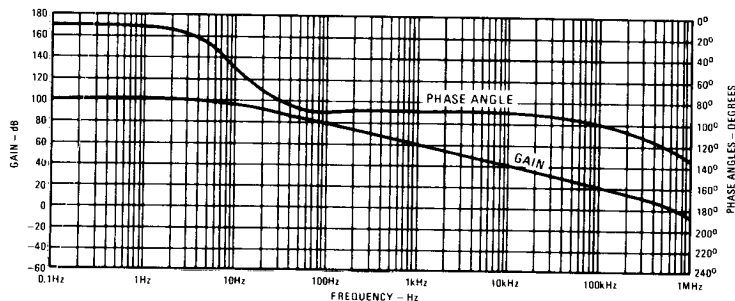
VOLTAGE GAIN AS A FUNCTION OF TEMPERATURE



NOTE: Open loop (comparator) applications are not recommended, because of the above characteristic.

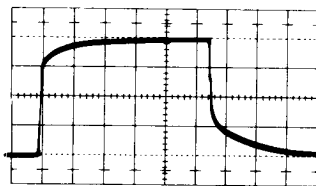
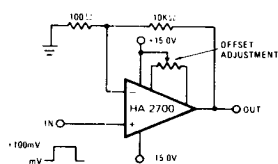
TYPICAL PERFORMANCE CURVES (continued)

PHASE-FREQUENCY RESPONSE FOR THE HA-2700



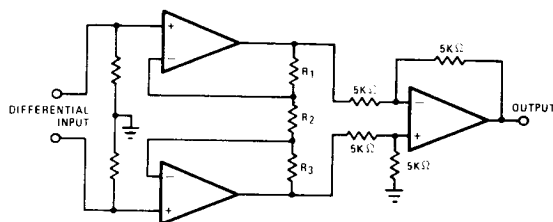
TYPICAL APPLICATIONS

HIGH GAIN AMPLIFIER (100 V/V)



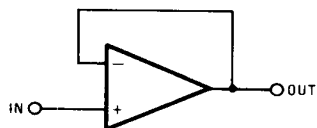
SCALE
Horizontal - 20μs/division
Vertical - 5.0V/division

DIFFERENTIAL INPUT INSTRUMENTATION AMPLIFIER



$$\text{THE GAIN IS GIVEN BY: } \frac{(R_1 + R_2 + R_3)}{R_2} = G$$

UNITY GAIN VOLTAGE FOLLOWER



Non-inverting unity gain with a 2KΩ and 100pF load
TOP: $V_{IN} = 10.0V$ Peak to Peak
BOTTOM: V_{OUT}
SCALE: Horizontal - 1μs/division
Vertical - 5.0V/division

NOTE: Faster increase rise and fall time and increase distortion on output wave form.

